JUL 24 1912

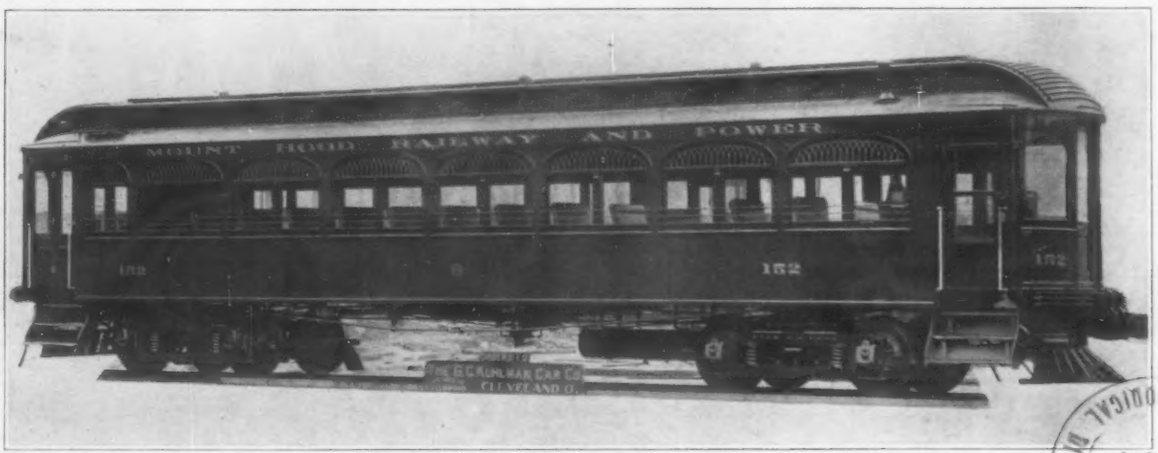
JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the act of Congress March 3, 1879.

VOL. XXIX NO. 3 | SAN FRANCISCO, JULY 20, 1912 | PER COPY, 25 CENTS



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JOURNAL OF ELECTRICITY
POWER AND GAS
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VOLUME XXIX | SAN FRANCISCO, JULY 20, 1912 | NUMBER 3

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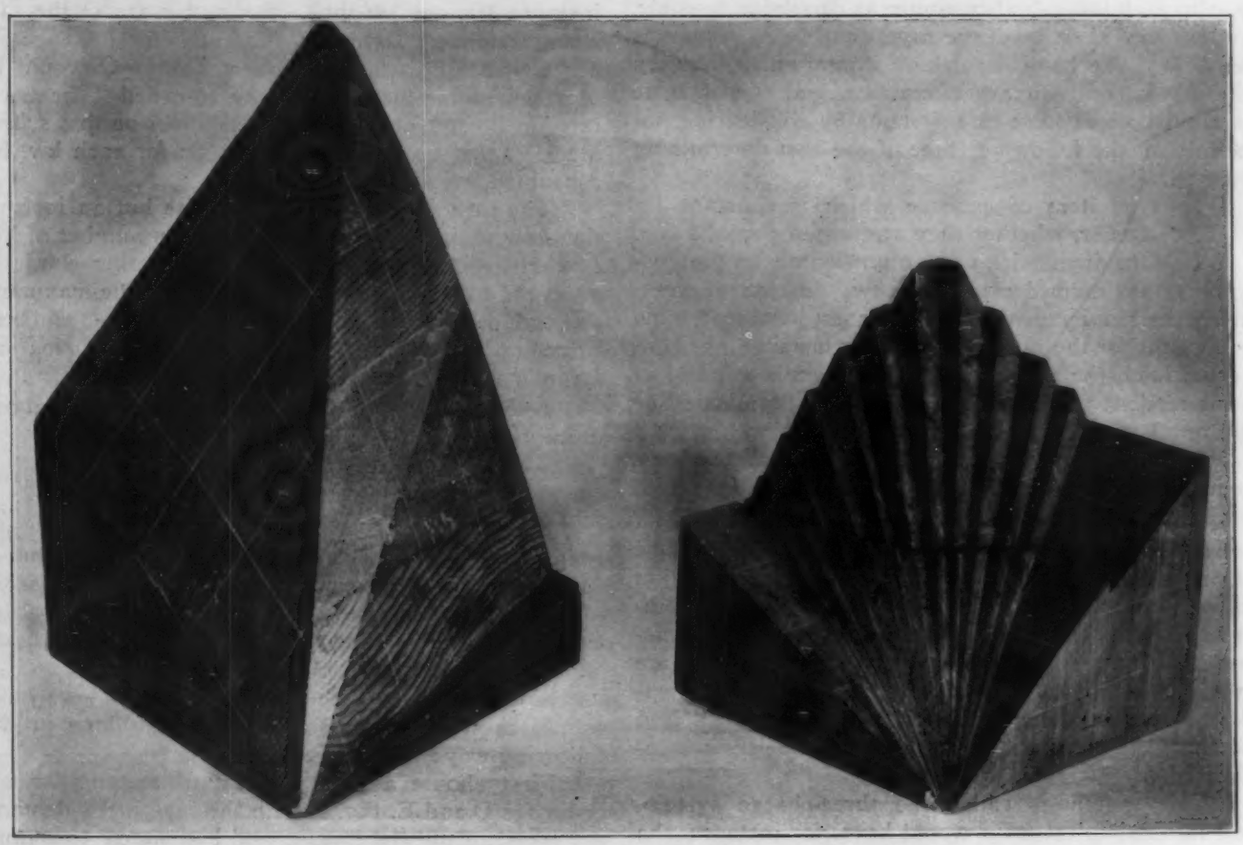
GRAPHIC REPRESENTATION OF ELECTRIC RATES[1]

BY H. E. EISENMENGER.

The basis of all rates for electric service, as well as the basis for the price of all other goods and services, is the cost of producing the same.

Some of the men who are giving their attention to the theory of rates contend that this ought to be the only basis of rates, whereas others maintain that the "value of service" to the customer should enter into rate making also in such a way that a larger percentage of profit should be involved in the rates for such customers to whom the electric service is of greater value, either for the reason that they derive financial benefit from it (money earning applications of electric motors, business lighting, etc.) or for the reason that money is of less value to them. On the other hand, customers who are in the position to construct and run a private plant of their own should be offered a rate with a smaller profit.



A Graphical Representation of a Celebrated Rate Determination.

Similar principles are acknowledged in price-making of other business; for instance, a theatre charges more for the front seats, simply because they are valued higher by the patrons than the back seats, although they cause exactly the same expenses. If the same price would be charged for all seats, the back

[1]The principles of rate analysis and geometrical representation as explained in this paper have been first published by the author in the First Report of the Rate Research Committee of the National Electric Light Association (1911), and then in the Electrical World of November 4, 1911. This paper contains several new aspects and instructive examples, and was read before the Portland Section of the A. I. E. E., May 21, 1912.

seats would have to be raised in price in order to obtain the same income, and thus a number of poorer theatre-goers would be deprived of the possibility to see the play. To quote another example, a physician may charge his wealthier clients more for the same service, and a minister will expect a higher marriage fee from a richer man. Railways give lower excursion fares in order to reach customers which either do not value the pleasure of the trip sufficiently, or to whom money is worth too much to pay the regular fare, etc. The railway is thus increasing the volume of their business and their earnings, and this may contribute its share towards the possibility of the lowering of the regular rates. Whichever of the two principles we adopt, the rates must always be based on the cost of service to the central station, to which we add a certain percentage of profit, which under the "cost of service" principle is a constant, and under the "value of service" principle will vary between classes of customers.

The cost of service depends on a very large number of factors. The rate maker finds himself in a dilemma, as on the one hand the rates shall follow the cost to each individual customer as closely as possible, and on the other hand, the rates shall be as simple as possible. We have to make a compromise between these two contradictory postulates, and this is done in almost all existent rate systems by considering not more than the following three of the cost determining factors.

1. One item of expense which is constant for every customer, whether they are large or small.

2. One item which is proportionate to the customers' maximum demand d in kw. Instead of measuring the maximum demand, in many instances some equivalent for the same is taken; for instance, the connected load, the number of sockets connected, and in some modern rates the floor area to be illuminated or the number of rooms (in residences).

3. One item proportionate to the energy consumption in kw. hrs.

There are other items which influence the cost of service to the customer; for instance, the distance from the central station, the character of distribution lines in the part of the city occupied by the customer's premises (underground or overhead), the customer's diversity factor, etc., but all these factors are averaged for each schedule into the three above mentioned ones. If we would try to take them all into account, the schedule would become hopelessly complicated.

This system is called the three-charge system, and in its simplest form would have, for instance, the following shape:

Each customer is charged a fixed amount of 50c per month, and, besides, $3.00 every month for each kw. connected; moreover, he has to pay 2c for each kw. hr. consumed. The first amount (50c in this example) is called the customer charge or connection charge; the second ($3.00) the demand charge, and the third one (2c) the kw. hr. charge.

It will be shown later that this direct way of expressing the three charges is not the only one. In many cases other ways of expressing these rates are preferred, which disguise the three-charge rate to a certain degree.

Calling now

a=The amount of an individual customer's monthly bill in cents.

d=His maximum demand in kw. (or connected load or sockets, floor area, etc., as specified by the rate).

e=His monthly energy consumption in kw. hrs.

x=The customer charge per month in cents.

y=The demand charge in cents per kw. maximum demand of connected load (sockets, 1000 sq. ft., rooms, etc.) per month.

z=The kw. hr. charge in cents per kw. hr.

We have then $a = x + dy + ez$, where in the above example

x= 50c
y=300c
z= 2c

a, d and e are the variables.

Special cases are frequently used where one or two of the three values, x, y, z, are O. For example, if x and y are O, we have a straight kw. hr. rate (for instance 10c per kw. hr.); if x and z are O the rate changes to a straight kw. flat rate (for instance, $5 per month for each kw. connected); y=O would be represented for instance by the so-called "Theatrical rate" in Boston, charging each customer on that schedule $180 per month, and besides, 3c for each kw. hr. consumed, etc.

The rate schedule is nothing else but an instruction how to figure the bill for any given number of kw. (sockets, rooms, etc.) and kw. hrs.; in other words, it gives the customer's bill as a function of the maximum demand d, and the kw. hr. consumption e, and can therefore be expressed in the shape of a mathematical formula a=f (d, e). For instance,

a=50+300 d+2 e (Three-charge rate of the above example)
or a=10 e (Straight 10c per kw.-hr. rate)
or a=18000+3 e (Boston theatrical rate), etc.

Every engineer is aware of the usefulness of graphical representation of all kinds of functions of variables, and in thoroughly investigating the nature of a given system of electric service rates, comparing them with other rates, etc., graphical methods are almost indispensable.

Since we have three variables—a, d, e—we have to use three dimensions, which is best done in the following way:

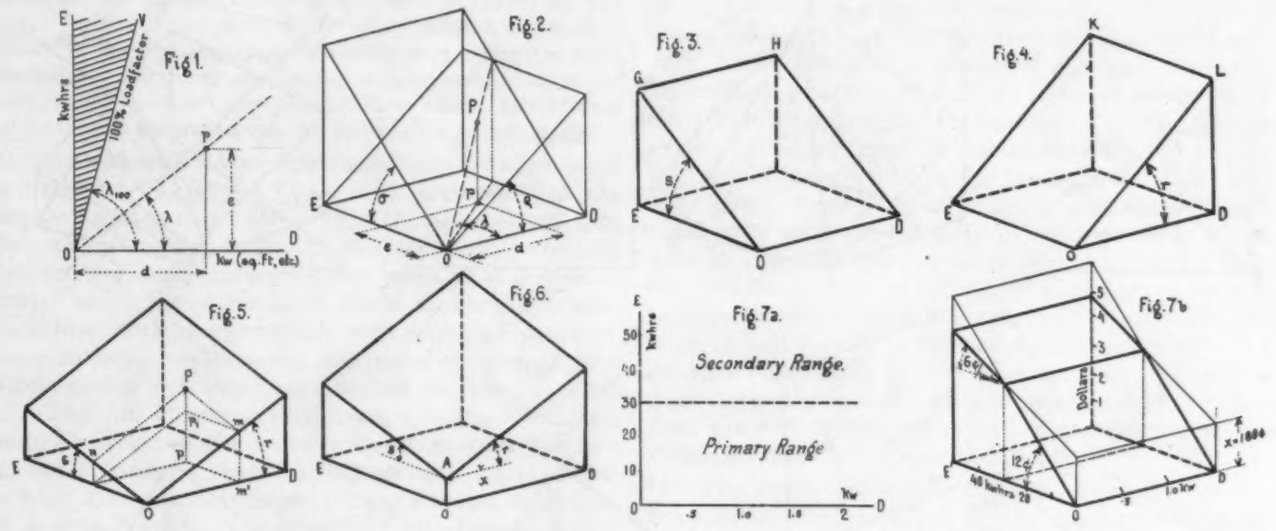
First choose a plane system of rectangular co-ordinates D and E, Fig. 1, with the customer's demand d stepped off on the D axis, and his energy consumption e on the E axis. Each customer is then represented by a certain point p, giving his individual maximum demand d and his energy consumption e. If we connect p with the origin of co-ordinates O, the connection line O p includes an angle λ with the axis of D, where tan λ is proportional to the load factor L.

Since $L = \frac{e}{d}$, it is obvious that a load factor of 100 per cent is not represented by an angle of 90 deg., but

by a smaller one, the size of which depends on the relation of the scales of d and e. We thus get an angle λ_{100} the vector O V, which is determined, for instance, by the point d = 1 kw., and e = 730 kw.-hrs. (730 = number of hours in a month). That part of the area which is beyond the vector O V (shaded area) has no meaning in practice.

Stepping off now the third variable a, the amount of the customer's bill, normal to the horizontal plane D E upwards into space, Fig. 2, we get for each customer a point in space P where p P is the amount of the respective customer's bill under the system of rates under consideration.

If we pass a plane through P and the axis of D, this plane includes an angle δ with the horizontal D E plane, Fig. 2, and $\tan \delta = \frac{a}{e}$ = average price per kw.-hr. and similarly $\tan \alpha = \frac{a}{d}$ equals the average price per kw.



per kw.

If we now step off the corresponding length p P for every point p, all these points P together will form a surface which is the geometrical representation of the function a = f (d, e) and therefore also of the rate.

We see that if two different rate schedules are represented by the same surface (or also by the same function f) then the two schedules are identical, in so far as they express the same rate in a different wording, and this resolution of rates into equations or surfaces is a most valuable instrument for determining the true nature of a rate, as will be shown a little later.

The straight kw.-hr. rate, a = z e, is represented by a plane passing through O D such as O D G H in Fig. 3, where tan s is the kw.-hr. charge z. In this case δ of Fig. 2 is constant and equals s of Fig. 3, since with a straight kw.-hr. rate, the average price per kw.-hr. is constant and equal to the kw.-hr. charge z. The average price per kw. (represented by tan α), however, would be variable.

Conversely a flat demand rate would be represented by Fig. 4 and tan r = y = constant = charge per kw. maximum demand. The average price per kw.-hr., tan δ, is variable.

The so-called Hopkinson rate charges a certain amount for each kw. of maximum demand, and besides makes an additional charge for each kw.-hr. consumed. We see that this is a three-charge system with the customer charge x suppressed, and the equation will be a = y d + z e. This rate is a combination of the straight kw.-hr. rate, Fig. 3, and the flat demand rate, Fig. 4, and is therefore represented by a combination of these two figures, that is a plane issuing from the origin O at a certain inclination towards both axes D and E (Fig. 5), where again tan r = y and tan s = z (as can be seen for instance by setting e = O, then the equation of the plane reduces to the equation of the trace on the vertical A D plane a = y d, and since this trace, evidently, according to Fig. 5, has the equation a = d tan r, it follows that tan r = y and in a similar way tan s = z. The algebraical deduction under Fig. 5 arrives at the same conclusion in another way.

The next step is the general case of the three-charge rate, a = x + y d + z e. All ordinates of the type Fig. 5 are simply increased by a constant amount x, and Fig. 5 changes into Fig. 6 where the customer charge x is geometrically represented by the vertical distance O A above the origin O, at which the plane of rates intersects the axis of a (the same results can be found by setting both d and e = O in the equation of the plane, which will result in a = x for d = e = O).

Not all rates express the three charges in the simple way shown heretofore; in many cases the charges are only implied in the rate, and can be found only by mathematical analysis. The most important of these methods is the block rate system.[1]

A few examples will explain this quicker than abstract deductions:

Let us assume a rate charging 12c per kw.-hr. for the first 30 kw.-hrs., and for the excess 6c per kw.-hr. 12c per kw.-hr. is then called the "primary charge," and the first 30 kw.-hrs. are the "primary range"; 6c

[1]The nomenclature is following the proposals of the Rate Research Committee of the National Electric Light Association, 1912.

per kw.-hr. is the "secondary charge," and all kw.-hrs. beyond 30 kw.-hrs. are the "secondary range," Fig. 7a.

In the primary range ($e<30$) we have a straight kw.-hr. rate:

$$a = 12\,e.$$

In the secondary range, however, we have to pay 12c for 30 kw.-hrs., and 6c for $(e - 30)$ kw.-hrs. We therefore get the following equation:

$$a = 12 \times 30 + 6\,(e - 30)$$
$$= 180 + 6\,e.$$

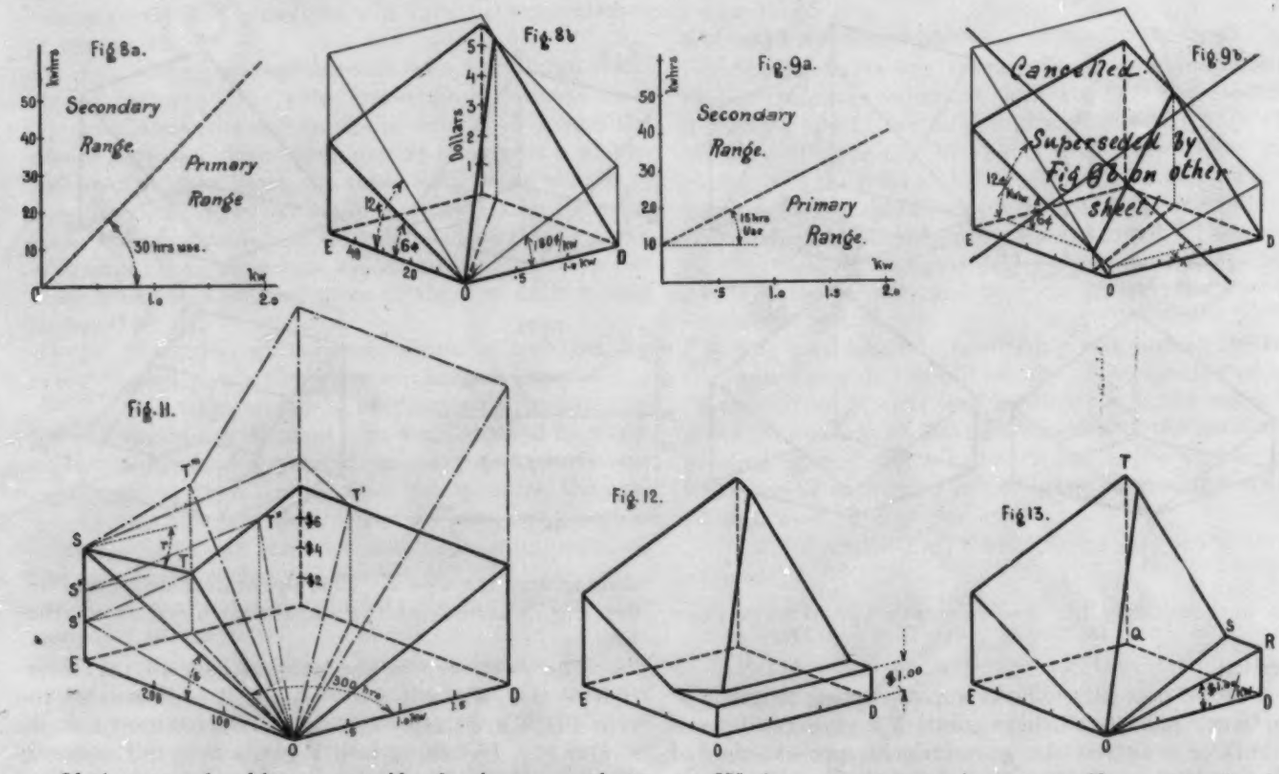
The first term on the right side is independent of both d and e, and is therefore in the nature of a customer charge. The second term is proportional to the energy consumption, and is the result of a kw.-hr. charge. We see that in the secondary range we have a customer charge of 180c—no demand charge—and a kw.-hr. charge of 6c per kw.-hr. The geometrical representation of the rate will look like Fig. 7b.

rate) in its secondary range is identical with the Hopkinson rate.

The first named rate (Fig. 7) contains, therefore, the charges x and z, the second named (Fig. 8) y and z, and it may be expected that a combination of the two will express all three charges, x, y and z.

A rate of that kind would be, for instance: 12c for a number of kw.-hrs. which is made up of 15 hours' use of the maximum demand plus 10 kw.-hrs.; 6c for the remainder of the kw.-hrs. Thus, for instance, if a consumer with 2 kw. maximum demand has consumed 60 kw.-hrs., he has to pay at the primary rate: $(15 \times 2) + 10 = 40$ kw.-hrs., and the balance of $60 - 40 = 20$ kw.-hrs. at 6c. The primary and secondary range are represented in Fig. 9a. The equation for the secondary range is

$$a = (15\,d + 10) - 12 + [(e - 15\,d + 10)]\,6$$
$$= 60 + 90\,d + 6\,e.$$



If the rate should now specify, for instance, that a lower secondary charge takes place not after the first 30 kw.-hrs., but after the first 30 hours' use of the maximum demand, or in other words, after the load factor of 30 hours is reached, then we have in the primary range again $a = 12\,e$, but the primary range as per Fig. 8a is different from what it was in the first example. In the secondary range we have to pay that number of kw.-hrs. at 12c, which corresponds to 30 hours' use of the demand d, or in other words 30 d kw.-hrs., and the balance of the kw.-hrs. at 6c; that is

$$a = 30\,d - 12 + (e - 30)\,6$$
$$= 180\,d + 6\,e.$$

That means we have in this case in the secondary range no customer charge, a demand charge of 180c per kw., and a kw.-hr. charge of 6c, which is conform to the model Fig. 8b. The model and the equation show alike that this rate (which is the famous Wright

We have a customer charge $x = 60$c per month
a demand charge $y = 90$c per kw. per month
and a kw.-hr. charge $z = 6$c per kw.-hr.

There is a variety of different other ways to the same end of working the equivalent of a customer and demand charge into the rate; for instance, by giving certain discounts on the price of the kw.-hrs. in the secondary range, or by following the method of the St. Louis residence rate, which has been analyzed by the author in the "Electrical World" of March 23, 1912.

[To be continued.]

The Berne radio-telegraphic agreement as to ship call letters is being rapidly conformed to by Pacific Coast ship-owners. The international bureau has assigned the W group of letters to vessels plying in the Pacific.

WESTERN LAWS OF ELECTRICITY AND WATER

THE RECLAMATION ACT.

BY A. E. CHANDLER.

In the case of United States v. Hanson, 167 Fed. 881, the Federal Circuit Court of Appeals thus expressed itself regarding the need for the Reclamation Act:

Congress passed the Reclamation act to make marketable and habitable large areas of desert land within the public domain, which lands are valueless and uninhabitable unless reclaimed by irrigation and the irrigation whereof is inmpracticable except upon expenditure of large sums of money in the construction of a system of reservoirs and distributing canals. All previous efforts of the government to make these arid lands available for settlement had resulted in failure. By the Desert Land act of March 3, 1875, Congress has made provision for their use by individual settlers, and on March 3, 1877, had enacted further legislation to facilitate the reclamation of such lands by private entrymen, and in 1894, to provide for the irrigation of the arid public lands, had passed the Carey act, by which it proposed to donate to the states in which such lands were located, so much thereof, not exceeding one million acres in each state, as the state would cause to be reclaimed. These efforts having failed to accomplish the desired end, the Reclamation act was passed.

Although the above statement may be considered entirely too strong by many who have watched the development under the Carey Act, it is certain that the many western societies interested in irrigation labored for years to secure the passage of some act under which the nation itself would do the actual construction work in connection with storage and diversion projects. After many unsuccessful attempts the Reclamation Act was finally passed on June 17, 1902.

The Act creates a fund known as the "Reclamation Fund" from the moneys received from the sale of public lands in the following western states: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming. As the public lands in Texas belong to the state, the original Act did not include Texas but its provisions were later extended to Texas by special congressional and state legislation.

The Secretary of the Interior is authorized to do the many things provided for in the Act and in connection with the development of any project he must withdraw from public entry the lands required for the irrigation works and also must withdraw from all entry, except under the Homestead laws, the lands deemed irrigable under the proposed project. If later the project is held to be not feasible the lands so withdrawn are to be restored to entry. The two withdrawals mentioned above were originally called first form withdrawal and second form withdrawal. As the irrigable lands could be entered under the Homestead Act, although subject to all the limitations and conditions of the Reclamation Act, they were settled upon in many cases just as soon as it was known that a Reclamation project was proposed. As the project had not been sufficiently developed for the Land Office to know what lands would be irrigated, much land was occupied above the canal lines. Furthermore, as the project was slowly developed and as the settlers had few means of making a livelihood, there was much dissatisfaction. This difficulty was removed in the later projects by the Secretary of the Interior withdrawing all lands under the first form. There was some question as to the legal power of the Secretary to withdraw irrigable lands under the first form and the doubt was removed by a Congressional Act in 1910. By an amendatory Act approved February 18, 1911, it is provided that no entry shall be made and no entryman shall be permitted to go upon lands reserved for irrigation purposes until the Secretary of the Interior has established the unit of acreage, fixed the water right charges and the date when water will be delivered.

As soon as a project is found practicable and contracts have been let, the Act provides that the Secretary "shall give public notice of the lands irrigable under such project, and limit of area per entry, which limit shall represent the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands in question; also the charges which shall be made per acre upon the said entry, and upon the lands in private ownership which may be irrigated by the waters of said irrigation project, and the number of annual instalments, not exceeding ten, in which such charges shall be paid and the time at which such payments shall commence." The charges announced by the Secretary in the public notice are determined with a view of returning to the fund the cost of the project and in practice are apportioned equally throughout the project.

The public lands subject to entry can be entered only under the provisions of the Homestead Act in tracts not less than ten nor more than one hundred and sixty acres. The entry is subject to the limitations and conditions of the Reclamation Act and the commutation provisions of the Homestead Act do not apply. The original Act placed the minimum area at forty acres. Before receiving patent the entryman must reclaim at least one-half of the total irrigable area of his entry and must pay the charges apportioned against the land entered.

Although private lands may be included within the project, no water right for such lands can be sold for a tract exceeding 160 acres to any one landowner, "and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments therefor are made." The Secretary has ruled that residence within fifty miles of the land shall be construed as "residing in the neighborhood of said land." It has also been held that a corporation is entitled to hold land under a government project, but as a condition precedent thereto a showing must be made that the aggregate area held by the corporation and its stockholders in their individual capacities does not exceed one hundred and sixty acres. As each individual is allowed to hold one hundred and

sixty acres of private land under such a project, there is little incentive for corporate holdings.

The Secretary is authorized to use the Reclamation Fund for the operation and maintenance of reservoirs and irrigation works. When the payments required by the Act are made for the major portion of the lands irrigated, the management and operation of the irrigation works is to pass to the landowners thereunder to be maintained at their expense under some form of organization acceptable to the Secretary; but "the title to and the management and operation of the reservoirs and the work necessary for their protection and operation shall remain in the Government until otherwise provided by Congress." It is noteworthy that the Act does not specify that the title to the irrigation works shall pass to the landowners. The only inference, therefore, is that the title to the works, as well as reservoirs, is to remain in the Government.

As in a number of other Congressional acts, it is expressly stated in this Act that it shall not be construed as interfering with state or territorial laws regarding the appropriation, use or distribution of water used in irrigation, or as in any way affecting any right to the waters of an interstate stream. The Secretary is directed to proceed in conformity with the local laws. The doctrine of appurtenancy is included in the following language:

> Provided, That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.

The original Act provided that within each ten-year period the major portion of the funds arising from the sale of public lands within any state or territory should be expended within the limits thereof. The section so providing was repealed by Congress in 1910 so that the Secertary is now at liberty to expend moneys on feasible projects regardless of the geographical source of such.

As stated above, the operations under the Reclamation Act are under the Secretary of the Interior. Prior to the passage of the Act in 1902, the Hydrographic Division of the Geological Survey had been making surveys of reservoir sites and proposed canals in many of the western states. After the passage this Division became the Reclamation Service under the supervision of the Director of the Geological Survey. In 1906 the Service was made a separate bureau of equal standing with the Geological Survey and its own director.

One of the first projects undertaken was the Salt River project made up of lands about Phoenix in Arizona. As practically all the lands included were in private ownership the question immediately arose as to what lien should be given the Government to induce it to build the project. The lien in the case of public land is assured as the title cannot pass until all the water right payments have been made. To satisfy the requirement in regard to the private lands, the first so-called Water Users' Association was formed. The shareholders of this association, which is regularly incorporated, are the landowners under the project. The capital stock is fixed at the estimated cost of the project and each acre is entitled to one share of stock. The association enters into a contract with the Secretary of the Interior pledging itself to repay the cost of construction. Each shareholder in executing his stock subscription agrees that the payments due upon his stock shall be a lien upon his land and shares, and that the lien may be enforced by the association by foreclosure in the manner provided by law for the foreclosure of mortgages. The land is thus bound to the association and the association to the Secretary.

Although not necessary as far as the lien is concerned, the practice has been to compel entrymen on the public lands to become stockholders in the association. As provided in the Act, the payments must be paid in ten annual instalments and the practice is growing of fixing a graduated scale for the instalments, so that they may not be heavy during the first few years. The association levies assessments on the shares of stock from year to year to pay the instalments. As the Act provides that the water right payments must be made to the local Land Office, a certificate from such office is accepted as payment by the association.

The receipts from the sale of public lands to June 30, 1910, and excepting the five per cent of such proceeds set aside for educational and other purposes, were $65,584,801, and the estimated total receipts to June 30, 1911, including $213,998 from the sale of townsite lots, were $71,717,990. The net investment of this fund in reclamation works on June 30, 1911, amounted to $60,940,834.

No new projects have been undertaken since March 4, 1909, and up to that time thirty-two primary projects (that is, projects actually under construction) have been undertaken, the net investment in which on June 30, 1911, amounted to $59,989,158. The area of land to which water could be supplied under such projects on June 30, 1911, was 1,025.609 acres and the total area under such projects was 3,101,450 acres. The charges levied on lands under such projects are divided into "water right building charges" and "water right operation and maintenance charges." The aggregate return for the former to June 30, 1911, was $1,533,-176, and for the latter, $517,394.

A number of the projects are so large that it was originally planned to complete only a portion and allow the returns from the Act itself to pay for the extension work. In order to complete such projects in the immediate future, Congress in 1910 authorized a special bond issue of $20,000,000, no part of which can be spent on new projects.

As was to be expected where the operations are of such magnitude and cover so much territory, the constitutionality of the Reclamation Act was early attacked but thus far it has been upheld (United States v. Hanson, 167 Fed. 881; Burley v. United States, 179 Fed. 1). In a former paper the Kansas v' Colorado case was discussed and it was stated that many at first supposed that the Reclamation Act was therein declared unconstitutional. The point made by the Court, however, was that Congress could not override state legislation in regard to the reclamation of arid lands and the Supreme Court went on to show that the Reclamation Act not only did not do so, but specifically provided for the observance of local law. In the paragraph of the decision showing the power of the Gov-

ernment to reclaim lands emphasis is laid upon the reclamation of lands within the territories and upon the reclamation of public lands within the states. In the two cases cited above as upholding the constitutionality of the Reclamation Act, the question of the power of the Reclamation Service to build projects for the irrigation of private lands only, within a state, was not raised. In the second of the two cases (Burley v. United States, 179 Fed. 1) the Court said:

It would be strange if the national government could enter the territory of a state where there were no public lands of the United States requiring irrigation and no public lands through which water flows necessary for the irrigation of arid lands, and by legislation provide a system of irrigation for the private lands within the state and control its administration. It would, indeed, be a strange proceeding, and obviously wholly outside of the authority of Congress.

But in this case the United States is the owner of large tracts of land within the states named in the act of June 17, 1902. The public welfare requires that these lands, as well as those held in private ownership, should be reclaimed and made productive. To do this effectively and economically with the available water supply large tracts must be brought into relation with a single system or project. These states having arid lands have accordingly acted upon the subject.

The Reclamation Act has now been in operation ten years and practically all of its thirty-two primary projects are furnishing water to settlers or landowners by canals constructed by the Government or purchased as a part of the project. As the water right charges in a number of cases are in excess of $40 per acre, the burden of meeting the first payments is in many cases a heavy one. There have, therefore, been constant appeals for relief. In commenting upon a suggested relief measure before the Senate Committee on Irrigation, Secretary of the Interior Fisher recently wrote as follows:

The passage of this resolution would lead to similar demands from a similar group of settlers on every project. The descent through successive general postponements to complete repudiation of a just debt may now be clearly discerned and easily made.

The Reclamation act was passed in 1902 primarily for the benefit of the West and upon the request of Western Senators and Representatives. Many voices were raised against it in the East freely predicting that the beneficiaries of this large expenditure would never repay the cost of the works. These prophets of evil did not believe that the government and people of the United States possessed the patriotism and wisdom necessary to carry through such a great and beneficent enterprise by the expenditure of public funds on a basis of justice and efficiency. They held that in a popular government such an enterprise must be dominated by selfishness, and must degenerate into a scramble for special favors at the public expense. Nevertheless, the act was passed in the faith that the pledge of repayment embodied in its terms would be fulfilled. It is my deliberate conviction that the passage of this resolution would be a first and very influential step toward the breaking of that pledge and toward the failure of the beneficent reclamation policy. I desire to see that policy extended and supported by additional appropriations from the miscellaneous public revenue. But the one indispensable condition to its extension, or even to its continuance, is the repayment by the settlers of the cost of the irrigation works. Failing such a repayment not another dollar should be expended in the construction of new projects or in the extension of those already opened.

In framing the Reclamation Act the intention was to make the terms of payment no harsher than then existed under private projects and as no private projects allowed in excess of ten years, that term was adopted. A great many viewing only the governmental character of the enterprise believe that this period should be extended to twenty or more years. The only reason suggested for greater leniency under government projects than under private projects is that the Reclamation Act necessitates residence upon or in the neighborhood of the land. It thus precludes the purchase of land by one who wishes to hold his present position and pay for the immediate improvement of the land by someone on the ground, with the intention of making the tract his home after reaching the productive stage. This course is possible under private projects and not only means that the absent owner and probably inexperienced farmer may in time possess a tract easily farmed, but also is a source of income to those residing on the project. The only object of the residence restriction in the Reclamation Act is to avoid speculation and by many it is believed that the restriction works against, rather than for, the project. It is certain that the period for speculation is the time prior to the delivery of water; that is, when the land values are comparatively low and when no payments need be made. As soon as the water is ready for delivery and the charges are imposed, traffic in land almost immediately ceases and the element of speculation disappears. It is probable that Congress will realize this condition in time and repeal the obnoxious residence clause.

The Reclamation Act, in brief, provides a revolving fund—first accruing from the sale of public lands in the western irrigation states—for the construction of irrigation works by the government for the irrigation of both public and private land and for the repayment of all moneys so expended by the settlers and landowners under the project. It aims to secure actual irrigation by providing that the title to the water right shall not be given until half of the land has been actually cultivated. The management of the canal system is turned over to the water users thereunder when a majority of the payments have been made.

BUREAU OF STANDARDS REPORT ON STATE GAS LAWS.

The National Bureau of Standards has prepared a report summarizing the provisions of the state gas laws, which shows that only sixteen out of the forty-eight states have laws for the regulation of gas service. Candle-power requirements are provided in the laws of California, Maryland, Massachusetts and New York. Sixteen candle-power is required in all California cities of more than 100,000 population. Twenty candle-power is required in Maryland for water gas, and about 17 c.p. or 18 c.p. for coal gas. In Massachusetts the minimum is 16 c.p. The requirement in New York is 16 c.p. for coal gas, 18 c.p. for mixed gas and 20 c.p. for water gas. An exception exists for the city of New York, where the requirement is 22 c.p. Wisconsin, New Jersey and Nevada are the only states in which a heating-value requirement exists under the statute. In Wisconsin and New Jersey the monthly average of gross heating value is required to be not less than 600 thermal units per cubic foot of gas, with a minimum of 550 thermal units. The corresponding requirements in Nevada are 550 and 500 thermal units respectively.

PHOTOGRAPHY IN ENGINEERING

BY M. R. LOTT.

Fixing.

After development the plate should be rinsed in water before being placed in the fixing bath. The combined fixing and hardening bath serves to clear the plate by reducing the silver bromide not already affected by the light and developer, and to harden the film. The length of time required for this operation depends upon the strength and temperature of the bath and should last four or five minutes after the whiteness of the film has disappeared. The formula for a chrome alum fixing and hardening bath is given later, hypo being the agent which acts upon the silver bromide.

Washing.

After fixing, the negative must be thoroughly washed to remove all traces of the hypo and to dissolve out the silver thiosulphates in the film, otherwise when the plate is dried it will have a stained and crystalline appearance which spoils its printing qualities. Washing may be accomplished either by means of flowing or still water. It is really a matter of time rather than quantity of water required. Washing may be most rapidly accomplished when running water is used. The plate is placed film upwards in a tray and the water allowed to flow over it. Forty-five minutes will be required for a thorough washing. A washing box is a great convenience, for it allows a number of plates to be washed at the same time. The water is arranged to flow upward past the plates from a pipe located in the bottom of the box.

When running water is not available, washing may be accomplished by soaking the negative in a tray of clean water for an hour. The water should be changed six or eight times during that period.

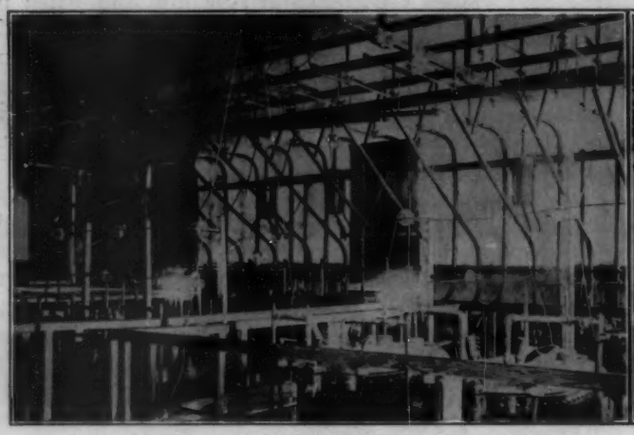
Drying.

After the washing process has been completed the plate should be gently swabbed with a tuft of cotton to remove any particles of sand which might be present, and then placed in a drying rack. Heat should never be applied, though a current of air from an electric fan may be used to hasten the drying process. The warmer the air in which the negative is dried, the more intense it will be.

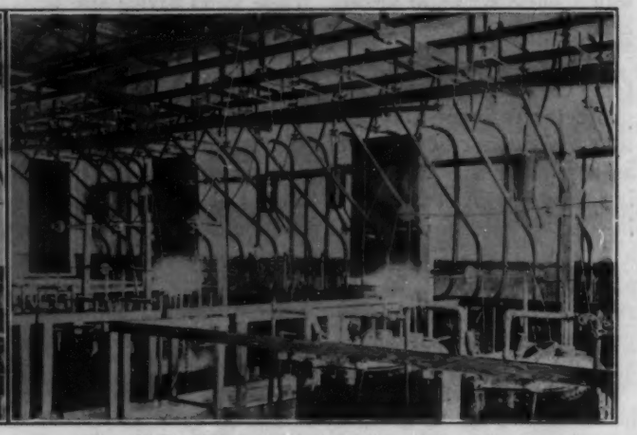
Alcohol may be used to hasten drying, though its use is not recommended, for the film is apt to pucker, due to uneven drying. The use of a fan is much more satisfactory and its action is quite rapid. The action of the alcohol is to penetrate the film and force out the water when the negative is placed in a tray containing it. After the alcohol has had an opportunity to penetrate the film the negative is taken out in the air, where it will dry rapidly.

Retouching.

When the negative is thoroughly dried it should be taken to the retouching stand, where spots caused by dust, as well as undesirable portions of the negative, may be eliminated by the use of opaque. Opaque is a thick red paint prepared as used by mixing it with water. It should be applied with a camel's-hair brush. A dense negative will stand retouching much better than a thin one, for the operation will not be so readily detected when the print is made.



Print Made from Negative With No Attempt to Shade Under-exposed Part.



Prine Made from Same Negative Using Cardboard Shading.

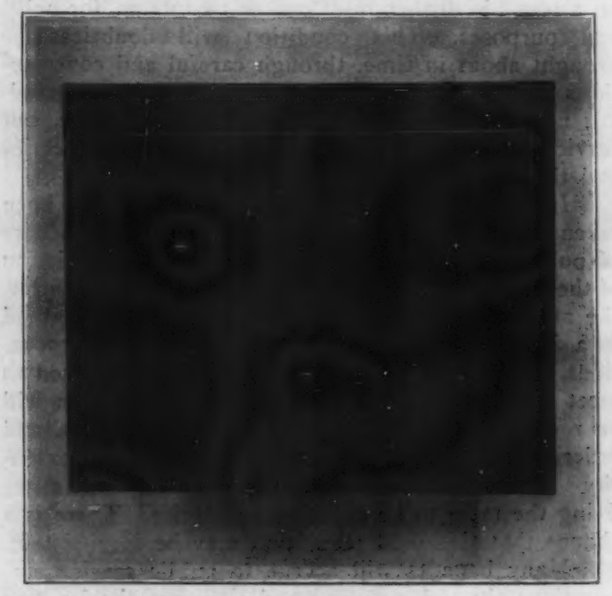
A neat way for handling the negatives made by photographing a drawing is to block it out to within a sixteenth of an inch of the border line on the film, the black paper used for lining plate and paper boxes being very good for this purpose. The paper should be pasted on the film side of the plate and then folded over and pasted on the glass side. This method has an additional advantage, for it allows plates to be stored away without scratching the film, as well as helps to protect the plates from breakage.

Printing.

Velox developing paper is an excellent kind of printing paper to use. The grade of paper suitable for the negative should be selected in each case. To secure contrast, regular carbon velox is very good and is particularly adapted for use with negatives made by photographing drawings. Velvet velox is good for landscapes and out-of-door views. The regular grade of velvet velox is used for most purposes and special is used with negatives having a great deal of contrast.

Printing may be accomplished either by means of a printing frame and a tungsten light or a printing box. When the negative is to be printed it is placed in the frame with the film side up, the paper concave side down, being next to the film, the cover is clamped down and the exposure to the light is then made. The time required for exposure depends upon the negative, dense ones printing slower than thin ones. Experience in judging a negative is the only guide for estimating the correct exposure.

The printing qualities of a negative may sometimes be greatly improved by shading; that is, by shielding the desired portion of the negative from the light. This applies to the sky portions of some negatives and to those which have a different intensity



A Negative Blocked Out With Black Paper to 1/16 in. of Border Line.

on different portions of the plate. Shading may be accomplished by means of a cardboard kept in motion between the negative and the light, the amount of shading required depending upon the negative. The cardboard must be kept in motion to prevent a definite shadow being formed on the print.

As velox is a developing paper—that is, a paper with a film in a manner similar to a dry plate—no image will appear until the development takes place. After exposure has been made the print should be immersed in water to insure an even flow of developer over it when it is placed in the solution. A print should be exposed long enough to require at least 15 seconds in the developer in order to secure the full brilliancy which exists when the blacks and the whites are both clear. Care must be taken not to use developer which is old or too weak, for stained prints will surely result from the length of time required to develop.

When the print is taken from the developing solution it is well to rinse it in water before placing it in the fixing bath. The fixing solution is made up of hypo and an acid hardener, the proportion of hypo not being as great as in the fixing bath used for plates, as it is apt to blister the prints. The time required for fixing the prints depends upon the strength of the bath. When potassium iodide is put in the developer it furnishes a means for indicating when the operation is complete, the iodide giving a yellow color to the prints which disappears when fixing is complete.

Prints which have been printed too deep may be reduced by use of the reducing solution given later. Places which need to be reduced locally should be treated with potassium cyanide either in the form of a solution or in the solid form being applied directly to the print. Potassium cyanide will also remove stains.

The prints must be given a thorough washing when they are removed from the hypo bath. The sink arrangement previously mentioned offers a convenient method. An hour's washing in running water is sufficient to remove all traces of hypo, provided the prints do not pack closely.

To dry prints, they may be placed face down on clean cheese cloth. A rack containing removable frames to which cheese cloth, tightly stretched, is tacked. The frames are stacked one above another, providing a means for accommodating a number of prints at the same time.

Prints have a tendency to curl up as they dry, but may be straightened by drawing the prints under the edge of a triangle or ruler. After this treatment they may be further flattened by placing them in a letter press.

Prints should be trimmed to the desired size by means of a print trimmer. Photographs of tracings and drawings made on 10 in. by 12 in. plates may conveniently be trimmed down to letter size, 8½ in. by 11 in., making them suitable for binding with reports, etc. The trimming process tends to keep the prints flat, because it removes the edge which tends to curl.

When prints are mounted, they should be first immersed in water and laid face down on glass (glass-topped work table in the studio), one above another, so that two edges of each print are uncovered for about an eighth of an inch for convenience in picking them up. The surplus water is then removed by a roller. Paste is applied to one at a time as they are used. A roller helps to make the prints stick and to remove the air from underneath when the prints are placed on the mounts.

Every negative should be numbered and placed in a file and a catalogue made of the prints from each one for convenience in identifying them.

U. S. GOVERNMENT HEARING ON FLANGE FITTINGS.

The Navy Department, Bureau of Yards and Docks, Washington, D. C., held a hearing June Seventeenth for the purpose of giving certain manufacturers an opportunity to give reasons why they do not recommend the use of the 1912 U. S. Specifications on Government work. The consensus of opinion at the hearing was in favor of the 1912 U. S. Standard. During the remainder of the hearing the discussion settled down to what time would be necessary before everyone could be supplying material according to the 1912 U. S. Standard and the general consensus of opinion seemed to be that within two years the new standard would probably become universal.

NO HONEST CORPORATION FEARS HONEST REGULATION.

BY R. H. BALLARD.

Public service and the control of public service corporations is a vital question of the hour with the people at large in this, and practically all sections of the country. It is naturally a most important question to those of us who are engaged in supplying public service. It has been difficult for some of us who are connected with public service corporations to fully appreciate that our business is different from the private business of our friends and neighbors.

A comparatively few years ago, public service corporations, about which so much is said today, were unknown. The business now being done by these

R. H. Ballard.

corporations was generally limited to a very confined radius and conducted by individuals who found their own capital was ample to carry on the business as it then existed. In the last few years, however, the development of the country has been so great that the demands for capital for extensions were more than could be met by individuals. This resulted in the combining of individual efforts and in the formation of the corporations of the present day.

There are those who have a feeling that a corporation is some hidden monster antagonistic to the people at large, and against the government. It is not unusual to meet a man who will say "I know your president; he is a fine man; you have a fine lot of fellows in your company, but I have no use for corporations."

Such a man certainly does not realize that a corporation is simply a collection of men who have come together to work in a co-operative way to accomplish some great enterprise that no one man can carry out alone. We say that the president and other officers and heads of departments work for the corporation. This is a mistake. They are not working for the corporation, but in reality are the corporation. If the public has confidence in these men, then it should have confidence in the corporation. These men have a duty to perform in the protection of the property entrusted to their care, which has been purchased with moneys invested by the general public in the enterprise. Receipts for this money are issued in the form of stocks and bonds. Efficient, careful operation is essential to enable the furnishing of the commodity to the public at the lowest possible rates.

It is a common belief that the methods of public service corporations are secretive and that it is their desire to withhold from the public all information pertaining to operation, submitting only such data as may be required by law. It is unfortunate that such belief exists, as I am confident that the modern public service corporation anxiously awaits the time when it may lay all of its affairs before the public with the assurance that such conclusions as are reached regarding its business will be based on all the facts rather than on a possible distortion of one or two items, for political purposes. This condition will doubtless be brought about in time, through careful and conscientious regulation of the affairs of corporations, including not only the regulation of rates of charge, but service conditions, extensions to plants and properties and the issuance of stocks and bonds.

In California a long step in this direction has been taken in the passage of legislation placing the affairs of public service corporations under the jurisdiction of the Railroad Commission. Unfortunately, however, the authority given this commission does not extend to a full regulation of the business of these corporations, and we may, temporarily at least, be forced to meet a condition where the railroad commission will be regulating the issuance of stocks and bonds, and ordering expenditures by the corporation for extensions and improvement, while municipal bodies are fixing the rates to be charged for service. There is a chance that this dual regulation may be inconsistent.

Many benefits will accrue to public service corporations through proper regulation, not the least of which will be the absolute stability of their securities and protection from unnecessary competition.

Investments in tin power houses and cheap inefficient machinery, for the purpose of competing with an established service by charging rates below cost, would not be permitted under a proper system of regulation. Promoters of these schemes seldom give consideration to maintenance or depreciation as they do not expect to be on hand when expenditures from the depreciation fund become necessary.

Perhaps the most popular feature of corporation regulation is the fixing of rates for service, and unquestionably the valuation of the properties of the corporation is the most important element in rate fixing. There are many theories as to the proper basis to be used for valuation, but no basis will stand the test of time and bring about harmonious conditions between the governing bodies and public service corporations that does not take into consideration all of the facts in relation to the establishment of the property. In most cases, much actual expenditure of time and money has been made to bring the property up to its present state of efficiency for which no adequate compensation has been received. It is distinctly unfair to consider as a basis of valuation simply the present value of physical property based on present day prices with deductions therefrom for age. In the elec-

trical lighting and power field, the brunt of the development of the art has been borne by the present companies, and enormous sums of money have been expended in experiments and development. Were it not for these, the art would be much less advanced compared with achievements of today, and it would therefore appear that valuations at simple present day prices with no consideration for the cost of development would be in the nature of taking something for nothing. The companies would receive absolutely no return for the years of work and the money expended in development. If it could be shown by a careful analysis that the earnings of a company in the past had been sufficient to compensate for the cost of these developments, no hardship would be done, but in the majority of cases the earnings in past years have not been sufficient to absorb this, in addition to a fair interest rate on the money invested, and the creation of a proper depreciation fund.

No honestly conducted service corporation need fear honest regulation but politics has no place in fair regulation.

DEFINITIONS OF SOME IMPORTANT TERMS.

Integrated Peak—A peak load as given by an integrating meter for a period of time corresponding to the duration of the peak.

Connected Load-Factor—The Connected Load-Factor is the ratio (stated in per cent) of the kw-hr. registered by a watt-hour meter during any given period (as a day, a month or a year) by any connected load, to the kw-hr. which would have been registered due to same connected load during the same period (day, month or year) if all the apparatus making up this connected load had continuously consumed its full normal kilowatts (rate of current at normal voltage) during the entire period.

Note—Where the kw-hr. readings are not available, the k.v.a.-hours should be substituted. In certain cases, notably alternating-current generators and transformers, the k.v.a. is more important than the kw., if their capacity is being considered.

Capacity Load-Factor—The Plant Capacity Load-Factor is the ratio (stated in per cent) of the kw.-hr. actually delivered by a plant (or by any specific section of a plant such as series direct-current) during any given period (as a day, a month, or a year) to the kw.-hr., which the same plant (or the same section of it) would have sent out had it operated throughout the period continuously at its full normal rating.

Note—Where the kw.-hr. readings are not available, the k.v.a.-hours should be substituted.

Demand Load-Factor—The Maximum Demand Load-Factor is the ratio (stated in per cent) of the kw.-hr. actually delivered by a plant (such as multiple direct current) during any given period (as a day, a month, or a year) to the kw.-hr. which the same plant (or the same section of it) would have sent out had it operated throughout the same period continuously at the maximum rate recorded.

Note—Where the kw.-hr readings are not available, the k.v.a.-hours should be substituted.

Daily Load-Factor—The load-factor obtained by taking the mean load for one day, and dividing it by the peak load during that day.

Yearly Load-Factor—The load-factor obtained by taking the mean load for the year, and dividing by the peak load recorded during that year.

Integrated Value—The summation value of varying quantity over a definite period of time.

Note—The readings of watt-hour meters are integrated values, and are read by taking the difference between readings at the dial at the beginning and end of a definite interval of time.

Maximum Demand—The highest demand measured in a manner agreed upon or stated.

Note—The maximum demand may be based on the reading of a watt-hour meter for one hour, one-half hour, or any other period of time, or upon the readings of an indicating instrument, in which case, it should be called maximum indicated demand.

Maximum Indicated Demand—The highest load reached in a stated interval as given by an indicating or curve-drawing instrument.

Maximum Simultaneous Demand—The highest load at any time required to supply a number of individual equipments.

Note—The maximum simultaneous demand must be less than the sum of the individual maximum demands, if the latter do not occur at the same moment.

Peak Load—The highest load carried during a specified interval of time.

Note—Both the method of measuring the peak load and the interval of time covered should be specified. Thus, daily indicated peak load, or yearly peak load, for one hour, are correct expressions.

Simultaneous Demand—The sum of the demands, or load existing at the same time on a number of services.

Note—The simultaneous demand cannot be greater and will generally be less than the sum of the individual demands.

Watt-Hour Meter—An instrument registering watt-hours passing through an electric circuit. This term should be used in place of "Integrating" wattmeter, or "Recording" wattmeter.

GAS AND OIL ENGINES.

To meet the demand for information concerning internal-combustion engines and gas producers, the United States Bureau of Mines, Washington, D. C., has issued technical paper No. 9, entitled "The Status of the Gas Producer and of the Internal-Combustion Engine in the Utilization of Fuels," by Robert H. Fernald. Many valuable data are contained in this pamphlet, copies of which may be obtained upon application.

A GREATER LOS ANGELES.

One method whereby Los Angeles may evade the dictum of Chairman John Eschelman of the State Railroad Commission that outlying communities are not to be charged an excess rate for Aqueduct water is contained in a proposal of the civic bodies that all that part of Los Angeles County from the Orange County boundary and the Pacific Ocean to a point in the foothills, two miles east of Glendora, then following the contour of the foothills to the ocean and along the shore line to the starting point be included in the city limits.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE

Technical Publishing Company

Rialto Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Treasurer and Editor in Chief
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

On Library Cars of all Southern Pacific Trains.

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July, 1895
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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NOTES.

Many a municipal electric railway franchise is today in about the same position as the mule team which the electric car displaced,—no pride of ancestry, no hope of posterity.

The important position which the electrical contractor occupies in relation to the other elements of the industry bears a dual resemblance to the conundrum as to why the focus of a burning glass is like the father's stock ranch in Texas,—where the sun's rays meet (sons raise meat).

Novel uses for the electric current are being devised with such startling rapidity as to baffle completeness of record. The latest idea from Grandview, Washington, is to supersede hot air drying of fruit by electric drying. An electric fruit picker seems to be the only missing link in the chain of electric irrigation, electric drying and electric traction from the tree to the consumer.

A Dissertation on Regulation

The pendulum symbolizes regulation of physical matters. So regular are its movements that it is used to arbitrarily measure time, the most infinite of concepts, by the aid of gravity, the most constant of forces. Yet it is only after going to either extreme that it establishes the position of eventful equilibrium.

The public service commission typifies regulation of human affairs, meting out justice, which can be grounded only in the absolute and eternal, by the aid of public opinion, the most powerful of forces. Like the pendulum, it performs its functions by going to extremes.

Synchronism is not essential to regulation. The decisions of one commission may lag behind those of a second and lead those of a third, and yet the final outcome may be the same.

Today the California commission is being criticised because its opinion on competition as a means of regulation does not exactly coincide with the opinions already rendered by the commissions in Massachusetts, Wisconsin and New York. In its first three important decisions it allows electric power companies to enter a field already served by others, basing its ruling largely upon the contention that the adequacy of past service was not established. The balance of evidence favored the winners.

But in future cases it will be necessary to regulate rates for service. According to the cost data presented in the course of the first contentions a reasonable return on the investment of the one company means a wholly inadequate return on the investment of the other. The pendulum swings back. The futility of regulation by competition becomes evident when the competitors consolidate. The higher law, slow as time, resistless as gravity, brings the extremes nearer and nearer to the position of eventual equilibrium, a regulated monopoly.

Troubles of The Electrical Contractor

The electrical contractor complains that he works the hardest and earns the least; that he finds it more difficult to borrow money than to hoodwink the inspector, a well nigh impossibility; and that in the end he is allowed a choice between the insane asylum and the almshouse, only because the debtors' prison is a relic of the past. The entire electrical industry is otherwise in such a high state of efficiency and prosperity as to demand a serious investigation of the justice and correctness of these complaints and a careful study of how they may be remedied.

The fundamental reasons for the contractor's plight are not obscure. They are not primarily due, as is often claimed, to the architect or to the jobber, but to the contractor himself. Contracting is no longer a mere trade but a business. Business methods must be combined with manual skill to avoid failure. And the first commandment in the decalogue of business success is "Know thy costs."

The time has come for the electrical contractor to stop fault-finding and begin cost-finding. He is in business for profit and profit is gained only when cost is known. Cost is based on precise facts. It cannot be determined by approximation. Round numbers do not roll into round dollars, nor does profit associate with perhaps. When a contractor stakes his chance of loss or profit upon a guess he is gambling. Ignorance of cost allows price to be dictated by the customer and the contractor not only jeopardizes his own interests, but demoralizes the trade at large, particularly his competitor who tries to meet his unfair prices.

But cost-finding no more consists in the installation of a set of furniture and forms than does poker playing in the ownership of a deck of cards and a stack of chips. A contractor may have a ton of forms adapted for use in his business and not have a single advantage of a cost system. Cost finding is one of the most exact of sciences and its rules must be known by those who sit into the game.

The first rule, and the one hardest for the average contractor to learn, is that the operation of a cost system, as a definite, practical, clerical routine pursued for the purpose of determining costs, should be the primary duty of one who is not already burdened with as many details as is the manager of the business. A system is valueless unless the records are properly and consistently kept and the extra cost for clerical work is paid many times over by the saving effected in not being awarded contracts at cost or less. Increased volume of business does not always mean increased profits, while elimination of profitless jobs give more profit by doing less business. After he learns the true cost, the manager should see to it that every contract shall show a fair margin above it and also that the cost is not exceeded by careless workmen.

The greatest responsibility for failure to correctly estimate a job, and consequently for failure in the contracting business, rests with the workman. With the present unsettled labor conditions, such as are exemplified in the city of San Francisco, a contractor can never be certain but what his original estimate will be exceeded because of unforeseen and unreasonable demands from his workman. No matter how carefully he subdivides the work, how minutely he figures the various items, or how carefully his estimates are checked, his ultimate profit will always be in question until stable labor conditions can be assured. It is a fallacy to assume that wages bear any relation to the value of an hour's product and can be used as the basis of price making in the absence of a cost system. The time will come when the labor organizations will be subject to the same responsibility and liability as any other business organization, but until this relief is afforded electrical contracting must remain a hazardous venture under the exceptional conditions noted.

Such are the relations affecting cost conditions, the first commandment. In succeeding editorials these questions will be more thoroughly discussed and also the second commandment taken under consideration. "Know thy competitor." It is hoped that these can be discussed in a broad and fair-minded attitude of mind and with this end in view contractors and others are invited to make free use of these columns in order to shed light on every phase of the contractors' trouble.

An Engineer's Club

As noted on another page, the engineers of San Francisco are establishing a social club. From its modest beginning as a weekly lunch assemblage it is planned to expand into the dignity of a first-class club. There has long been need for such action and the personnel of the present promotors is such as to merit success.

Each of the national engineering societies have local sections which hold frequent technical meetings, but the social features have been somewhat neglected. The objects of this new organization are most commendable and its effect should be beneficial in removing the groove of isolation into which the specialist tends to burrow. As has been aptly remarked, such a groove differs from a grave only in its length and depth. The broadening influence of a club is essential in co-ordinating an engineer's work and in preventing mental warping. He can appreciate his own function in the plan of the universe only by coming in contact with others.

Just as collective has succeeded individual specialization, so is co-operation succeeding competition. The latter is as intense between engineers as in any other profession. It occasionally engenders hard feelings which can be smoothed out only by social meeting.

Furthermore, there is a decided need for a general engineering headquarters in a building occupied exclusively by engineers. The upper floors could be occupied as club rooms, a large auditorium provided for institute meetings and offices rented to engineers. It is hoped that this new club will succeed in fulfilling these requirements at an early date.

PERSONALS.

Robert Sibley, editor of this journal, is spending a two weeks' vacation at Carmel-by-the-Sea.

C. O. Poole, of the electrical engineering firm of Manifold & Poole, of Los Angeles, is a recent arrival at San Francisco.

Frank Lackner, of the engineering staff of the H. K. Porter Locomotive Works, of Pittsburg, is a San Francisco visitor.

R. D. Holabird, president of the Holabird-Reynolds Company, has just returned to San Francisco from an outing at Lake Tahoe.

L. D. Armstrong, of the Vix Engineering Company, has returned to San Francisco after a trip through the interior of California.

Clyde Smith, of the engineering department of the American Bell Telephone Company, is among the recent arrivals at San Francisco.

Charles Froding, of the Power Specialty Company, 814 Balboa Building, has returned to San Francisco from a month's eastern trip.

A. H. Babcock, hitherto electrical engineer of the Southern Pacific's Alameda County electrification, is given the title of consulting electrical engineer.

F. H. Woodward, formerly sales manager, has been placed in charge of the industrial and public service business of the Great Western Power Company.

C. F. Henderson, who was formerly connected with the Bermingham works, has joined the San Francisco sales force of the Crocker-Wheeler Company.

D. P. Robinson, president of the Stone & Webster Engineering Corporation, and **G. O. Muhlfeld**, the general manager, are at Seattle, after visiting California.

R. A. Bowden has left the apparatus sales department of the General Electric Company's San Francisco office to take a position with the Great Western Power Company.

R. G. Littler of the West Coast Engineering Company of Portland is attending the National Electrical Contractors' Convention as the delegate from the Oregon association.

H. R. Noack, president of Pierson, Roeding & Company, returned to San Francisco during the past week after a very successful hunting and fishing trip through the mountains.

F. F. Skeel, Western sales manager of the Crouse-Hinds Company, has finished a months' visit at Los Angeles and is now at Seattle. He will return East by way of San Francisco.

H. H. Sanborn, the rate expert of the Railroad Commission, and Commissioner **J. M. Eshelman**, are at Klamath Lake, and Commissioner **Max Thelen** is in the Sierras on a vacation.

W. S. Hanbridge, Louis Levy and **John Rendler** are attending the annual convention of the National Electrical Contractors' Association at Denver, Colorado, as representatives of the California Association.

R. F. Behan has returned to the Westinghouse Electric and Manufacturing Company's San Francisco office, after having observed the work in progress on the new development of the Pacific Gas and Electric Company.

F. H. Poss, manager of the Pacific Coast departments of the Holophane Company and of the Benjamin Electric Company, has returned from a vacation at Aetna Springs with Mrs. Poss. They motored through Lake County.

L. H. Baldwin, the northwestern representative of the Kellogg Switchboard and Supply Company, has returned to his headquarters at Portland after making an extensive Alaskan tour and finding business excellent with his lines.

H. E. Sanderson, Pacific Coast district manager of the Bryant Electric Company, has just returned to San Francisco from Los Angeles, accompaning **E. K. Patton**, the western sales manager, both continuing on a trip to Seattle.

R. J. Johns, export representative of the H. W. Johns-Manville Company, passed through San Francisco last Sunday on his way from Australia and China to New York. He reported business good with his lines in the countries on the other side of the Pacific.

Thomas E. Collins, manager of the detail and supply department of the Westinghouse Electric and Manufacturing Company's San Francisco office, was called to Los Angeles during the week to see his father, who was severely injured by an automobile accident.

A. K. Harford, superintendent of the Municipal Light & Power Company, has been promoted to fill the position of manager which was recently vacated by G. L. Bayley, who has accepted a position with the Panama-Pacific International Exposition Company.

J. H. Hornung has been appointed manager of the San Francisco division of the Great Western Power Company and will have charge of all the property of the City Electric Company except the steam plant, which is under the control of the general superintendent.

F. O. Blackwell, of the firm of Viele, Blackwell & Buck, consulting engineers for the Great Western Power Company, who recently spent several days at San Francisco looking over the plans for the extension of the hydroelectric system, left for the Pacific Northwest during the week.

R. J. Cantrell, property agent of the Pacific Gas & Electric Company, has returned from a visit to the scene of operations of the South Yuba construction department, where preparations are being made for the construction of a hydroelectric plant. Hydraulic monitors are being used for excavating on the face of the cliff and a large force of men is at work.

H. H. Noble, president of the Northern California Power Company, Consolidated, has returned to San Francisco from an inspection of the system. He says that one electric furnace at Heroult is in steady commercial operation on high-grade pig iron and another furnace of the latest type is under construction. **E. V. D. Johnson**, manager of the Northern California, is at Redding.

H. E. Sherman Jr. has been appointed manager of the Oakland division of the Great Western Power Company, and will have charge of all property and business in the Oakland division with the exception of the steam plant, the high-tension substations and the high-tension transmission line, lying within that district, which will be directly in charge of the general superintendent and his organization.

J. W. E. Taylor, formerly superintendent in charge of the Boulder development of the Central Colorado Power Company, and later superintendent of construction of the Yadkin River Power Company, at Pedee, N. C., is in charge of the power plant extension of the Great Western Power Company at Big Bend. Mr. Taylor's headquarters are at Las Plumas, Cal., and the field engineering and construction involved will be under his direction.

Thomas Collins of the Westinghouse Electric & Manufacturing Company's San Francisco office, delivered an interesting lecture, illustrated with moving pictures, recently, before the Ad. Men's Club in the new office building of the Great Western Power Company. The title of the lecture was "The Thrifty Family." Also some interesting slides were shown illustrating the Westinghouse shops at East Pittsburg and Newark, N. J., in operation.

G. L. Bayley has been appointed chief mechanical and electrical engineer for the Panama-Pacific Exposition Company with headquarters in the Exposition Building, San Fran-

cisco. Mr. Bayley was born in Solano County in 1875, was educated in the public schools of Oakland and entered the University of California with the class of 1897. After leaving the University he worked in the shops of the Union Iron Works for a short time and left there to go to Alaska with A. M. Hunt as his assistant in the construction of four large river steamers for the Yukon trade. After his return from Alaska he was sent by Hunt & Meredith to take charge of the construction of the Colgate power house. Shortly after the first units were put into operation he accepted an offer to go to Japan and stayed there four years, the last two years as manager of the engineering department of the American Trading Company, succeeding E. I. Dyer, now engineer for the Union Oil Company. The American Trading Company were the agents for many leading American and foreign makers of power plant, mining and railway equipment, and his work covered a wide range of engineering design and construction. He returned to America in 1904, by way of the Suez canal and Europe and engaged in the manufacturing business in Pittsburg for two years. On his return to San Francisco he was engaged to take hold of the Stanislaus project as resident engineer in charge of the construction of the power house, pipe lines, bridges and forebay dam. On completion of the Stanislaus plant he was employed by the city engineer of San Francisco in connection with the high-pressure auxiliary fire protection system now being installed. For the last three years he has been manager of the Municipal Light & Power Company of this city. He is a member of the American Society of Mechanical Engineers; the Electrical Development League, the Bohemian Club and the Faculty Club of the University of California.

GREAT WESTERN POWER.

The Great Western Power Company has issued the first number of its monthly coat-pocket magazine to deal with company affairs and the interest of its employees. Its purpose is happily expressed in the motto "One for all and all for one." Its ideals are of the highest, and following the precedent of the New York Edison Company, "It won't deal in personalities, it won't try to be funny, it won't accept advertising." The first number deals with the railroad commission hearings and decisions, a description of the motor drive in the plant of the Oakland Brewing and Malting Company, an organization chart, and short articles by several of the company officials.

TRADE NOTES.

P. G. Jones, manufacturers' agent, at 633 Howard street, San Francisco, has secured the agency for the Detroit coil, formerly manufactured by the American Fuse Company. A stock will be carried at San Francisco.

The Geary Street Railway, San Francisco, Cal., has ordered from the Westinghouse Electric & Manufacturing Company forty-three quadruple equipments of No. 306 CA motors and HL control.

The Standard Underground Cable Company, A. B. Saurman Pacific Coast manager, secured contracts for cable and other underground material, aggregating nearly $20,000 when the recent awards were made to supply the needs of the Department of Electricity during the coming fiscal year at San Francisco.

The Kellogg Switchboard & Supply Company has secured a contract for a complete control office equipment for the Juneau-Douglas Telephone Company at Juneau, Alaska. A switchboard, distributing frames and power equipment are included. The new apparatus will replace the old system in use at Juneau and surrounding territory.

George J. Henry Jr. and the Pelton Water Wheel Company were among those bidding on the hydraulic equipment for the No. 3 plant which the Southern Sierras Power Company will install at Laws to feed the long electric transmission line which has been constructed into Los Angeles territory. The specifications call for three 3000-h.p. generating units.

The General Electric Company has sold to the California Transportation Company two turbo generators for lighting installation on the steamer Fort Sutter. The ratings are as follows: One C. C. 2, 15-kw., 4500 r.p.m., 125-v. flat compound-wound Curtis turbine generating set; also one C. C. 2, 25-kw., 3600 r.p.m. 125-v., flat compound wound Curtis turbine generator set. Both units are arranged for operation on 160 pounds steam pressure, 24½ inches vacuum.

THE ENGINEERS' CLUB OF SAN FRANCISCO.

Another effort is being made to establish an engineers' club at San Francisco with the ultimate aim of performing the same functions as the New York club. The officers for the first year have been selected as follows: C. W. Merrill, president; A. H. Babcock, M. H. Peck, vice-presidents; A. M. Hunt, treasurer, and H. Foster Bain, secretary.

The following by-laws have also been adopted:

1. The name of this club shall be the Engineers' Club of San Francisco.

2. The object shall be to promote acquaintance and good fellowship among the engineers of San Francisco and elsewhere by means of weekly luncheons and in such other ways as may be determined.

3. Any member of the engineering profession or allied scientific pursuits, resident in or within fifty miles of San Francisco, shall, upon election as herein provided, be eligible to resident membership in this club.

4. Any person otherwise eligible for membership but living fifty or more miles from San Francisco shall be eligible to non-resident membership in this club.

5. Dues of resident members shall be $10 per year and of non-resident members $1 per year, each payable annually in advance.

6. Members may personally introduce guests at the luncheons and other meetings of the club, but this privilege shall be exercised under the rules of the executive committee and may be abridged or suspended by said committee at its discretion with regard to any meeting or any individual member or visitor, the latter by notice in writing signed by the secretary and addressed to such person.

7. The officers of this club shall consist of a president, two vice-presidents, a secretary, and a treasurer, who shall have the duties and powers usual to such positions and all of whom shall be elected annually to serve for one year and until their successors are elected and qualify.

8. The officers specified in Section 7 shall together constitute an executive committee, which shall have full charge of the business of the club, except as limited by the latter.

9. The executive committee shall have the power to suspend or expel any member for conduct incompatible with the interests of the club, upon giving such member reasonably previous notice of the charges preferred against him and an opportunity for a hearing. The board shall be the sole judge of what constitutes conduct incompatible with the interests of the club, except that a four-fifths vote of the committee shall be necessary to expel.

10. New members may be proposed at any time by any members and election shall be by ballot of the executive committee, a majority vote being necessary to elect; provided, that no person shall be elected until his sponsor shall have appeared in person before the executive committee to answer questions concerning the person proposed.

11. Regular meetings of the club may be held following luncheon at the Palace Hotel or elsewhere, at 12:30 p. m. each Tuesday, and special meetings at any time on call of the executive committee.

12. Amendments to these by-laws may be proposed by any member at any meeting and may be adopted by majority vote of members present at any subsequent meeting, provided they have been approved by the excutive committee. If not approved by the executive committee, they may still be adopted by an affirmative two-thirds vote of the members present.

INDUSTRIAL

THE ELECTRIC APPLIANCE COMPANY.

The Electric Appliance Company of San Francisco was organized in June, 1904, and opened for business in San Francisco at 717-719 Mission street, near Third, where they occupied quarters comprising about 25,000 square feet of floor space. The building in which they were located and its contents were totally destroyed in the great conflagration following the earthquake of 1906. Mr. C. C. Hillis, treasurer and general manager of the company, was in New York at the time of the disaster and inside of three days had started west a new stock to take the place of the stock destroyed by the fire. This stock was temporarily housed in a large warehouse on Townsend street, at which place they suffered another loss by fire within six months of the time of the April loss. They then moved to a warehouse on Main street where they were located temporarily while their building at 726-730 Mission street was being prepared for their occupancy. These quarters were occupied for a period of five years up until May 1st of this year, when the company, on account of its large and steadily increasing business, were forced to find more commodious quarters.

General Manager's Office.

Sales Manager's Office.

Accounting Department.

Sales Department.

They are now at 807-809 Mission street, near Fourth, where they occupy in its entirety a six-story and basement brick and concrete Class A building, having a frontage on Mission street of forty feet and running through to Minna street, and containing close to fifty thousand square feet.

The new quarters of the Electric Appliance Company have been fitted up so as to provide every facility for maintaining the excellent service for which this company is noted. Its officers have always given special attention to details that would insure prompt shipment and satisfactory service in every department and they have surrounded themselves with a corps of assistants who have ably taken care of their work in the department over which they had jurisdiction.

The company operates over the entire Pacific Coast States, including British Columbia, Alaska, the West Coast of Mexico and the Hawaiian Islands, and has a very satisfactory and increasing business in the Orient.

The officers of the Electric Appliance Company of San Francisco are: Willard W. Low, president; Thos. I. Stacey, vice-president; C. C. Hillis, treasurer and general manager; F. J. Cram, secretary and sales manager.

W. W. Low, president, and Thos. I. Stacey, vice-president, are president and secretary and treasurer of the Electric Appliance Company of Chicago, with which this company is very closely associated. Mr. Hillis has been engaged in the electrical business for a little over twenty years and was connected with the Electric Appliance Company, Chicago, prior to the organization of the Electric Appliance Company of San Francisco. Mr. Cram has been under the Electric Appliance Company banner for about sixteen years and is known from one end of the Coast to the other.

The city sales department is under the management of Albert Meinema, who is ably assisted by Grover Andersen, A. J. Dahlin, Charles Bigelow and E. E. Van Haren. T. D. Johnston is manager of the specialty department and automobile department. Charles E. Hearn, Henry F. Yost, C. J. Winslow and H. D. Havey are the traveling representatives

of the company and cover the entire Pacific Coast territory. The shipping and receiving department are under the supervision of Henry O. Sacht. Henry Zweifel is chief clerk and manager of the credit department. Albert F. Holmes is city buyer and H. R. Jenson is cashier.

In addition to the complete stock of electrical and tele-

City Sales Office.

phone supplies which the company handle, among which are many of the best known electrical specialties on the market, the Electric Appliance Company have recently added a complete stock of automobile supplies and it is the intention to carry a stock so complete that it will enable them to handle

Basement Storage.

this line of business in the same manner in which they have handled their electrical business in the past.

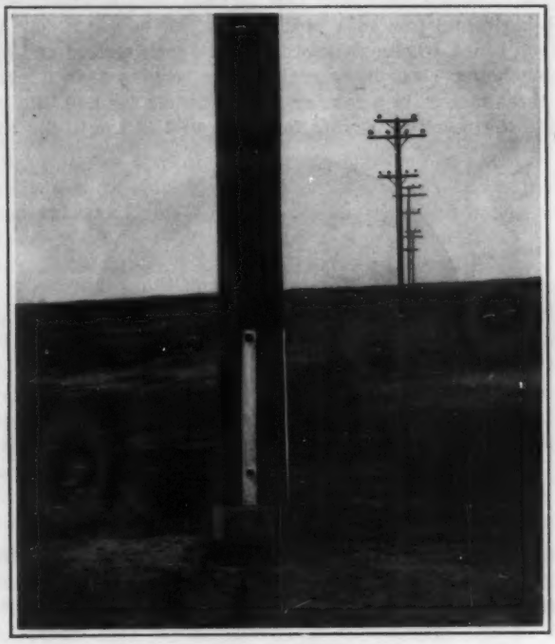
The Electric Appliance service will undoubtedly be appreciated by the automobile trade and it is to be expected, with the organization which they have, it will not be long before they occupy the foremost position in the automobile supply business which they do in the electrical supply business.

THE CONCRETE POLE BASE.

The rapid deterioration of telegraph, telephone and transmission line poles has long engaged the attention of engineers in providing some means to prevent the heavy losses ensuing. One of the most interesting and practical of the several methods proposed is the concrete stub recently patented by M. H. Murray. After severe tests as to their strength and life they have been found equally satisfactory and far more economical than wood poles and the only reliable method of preventing pole decay.

The bases are made in several standard sizes and may be used either in replacing old stubs or for new lines. In the former case the poles are sawed off about three inches above the surface, the rotted portion removed and the concrete stub inserted so that its top will reach this height, and thoroughly tamped in place. Holes are bored in the wooden pole after it is set back in place between the clamping irons, so as to obtain an exact fit; then the bolts are inserted and the job is complete as soon as the nuts are drawn up tight.

Two men have installed an average of five to six stubs per day of eight hours in rocky ground, where the stubs were distributed beforehand.



Pole With Concrete Stub.

This has been accomplished on a line carrying eleven thousand volts without interfering in any way with the operation of the line.

These concrete bases have been installed by several Pacific Coast power companies, one 50-mile, 11,000-volt line having been in service several years, the annual inspection of poles so equipped now being unnecessary and a great saving made to the company. These bases are now being manufactured and sold by the National Concrete Pole Base Company of Oakland, Cal.

SPACE-SAVING SWITCHBOARD METERS.

The increasing size of modern power developments and the growing scarcity of available space, particularly in large cities, have emphasized the need of compactness in switch-

Fig. 1.

board design. The desirability of having all the meters in plain view of one operator has long been appreciated, and this requirement necessitates not only that the meters shall occupy a minimum of space, but at the same time they must be easily readable so that all can be read from a common point. In many plants, in congested districts, the switchboard is lo-

cated in a poorly lighted place, which imposes the further requirement that the meter dials be capable of thorough illumination.

To accommodate and encourage these strongly defined tendencies in switchboard design, the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has developed a complete line of seven-inch, round-type switchboard meters. The size of these meters is such that three of them can be mounted in a horizontal row on a 24-inch panel, or two in a row on a 16-inch panel, whereas the ordinary 9½-inch meters and most of the better class horizontal meters require 30-inch panels for three meters in a row, or 20-inch panels for two in a row. While the resulting saving for one panel is small, the same

Fig. 2.

saving carried out in a whole switchboard amounts to considerable proportions. For instance, the switchboard recently installed at the Mare Island Navy Yard, using these seven-inch meters, occupies 28 feet; whereas 35 feet would have been required for the older type of meters. A proportional saving in marble, busbars and general wiring results.

A feature of a board of the character of that noted is the uniformity of appearance of all the meters. The Westinghouse line of seven-inch meters includes alternating current ammeters, voltmeters, single-phase and polyphase wattmeters, frequency meters, powerfactor meters, and synchroscopes; also direct current ammeters and voltmeters. It is the only complete and uniform line of seven-inch meters known to be on the market.

Fig. 3.

It is evident that the saving in space would mean nothing if the meters were not as easy to read as larger meters. In reality they are as easy to read as the Westinghouse 9½-inch meters, and easier to read than any other meters because of the length of their scales, the flat open faces, which permit thorough illumination, and visibility of the entire pointer, and the intense damping of the pointer.

The true measure of a meter's "space efficiency" is not alone the area it occupies, but really the length of scale per square inch of area occupied. A meter that occupies less area, but requires the operator to be closer or to move about in order to take a satisfactory reading saves little, as the number of meters that can be placed within range of the operator's vision from a given point remains the same. If, however, the same scale can be had in a smaller meter, the condensation of space is a distinct advantage. This result is obtained with the Westinghouse seven-inch meters.

The accompanying tables show a comparison of these new meters with older types, as to both length of scale and space economy for both A.C. and D.C. meters.

DIRECT CURRENT METERS.

Meter.	Height including terminals.	Width.	Area of enclosing rectangle.	Length of scale.	Sq. in. of rectangle per inch of scale.
Westinghouse 7"....	7 7/16	7 7/16	55	7"	7.85
Other 7" types.....	7 7/16	7 7/16	55	5"	11
Westinghouse 9"....	11¾	9⅝	113	7.8"	14.5
Other 9" types.....	11¾	9⅝	113	6"	18.8
Vertical edgewise...	15½	5 3/16	80	11.7"	6.8
Horizontal edgewise.	6	8½	51	6"	8.7
Illuminated dial....	12 1/16	15¾	190	15.3"	12.4

ALTERNATING CURRENT METERS.

Westinghouse 7"....	7 7/16	7 7/16	55	14.5"	3.8
Westinghouse 9"....	11¾	9⅝	113	14.5"	7.8
Other 9" types.....	11¾	9⅝	113	6"	18.8
Vertical edgewise...	15½	5 3/16	80	11.7"	6.8
Horizontal edgewise.	6	8½	51	6"	8.7
Illuminated dial....	12 1/16	15¾	190	15.3"	12.4

A glass cover instead of a metal cover with a slot in it is a feature the advantages of which have been realized for

Fig. 4.

some time in European practice. The possibility of good illumination can be easily appreciated. As economy of space is most important in congested districts where poor illumination is the rule, the necessity of making the best of the illumination obtainable is evident. Added to this is the fact that the pointer, being wholly visible, can often be read by its position, like the hands of a clock. This feature is particularly valuable in immediately detecting overloads, or variations in voltage, frequency, or powerfactor on corresponding meters.

Probably no other meters on the market are equipped with such intense damping as these new meters. The meters are "superdamped"; that is, the damping is such that the pointer does not overswing and return to the true reading, but comes up to the true reading and stops. Even a variation in load equivalent to full scale will not cause the pointer to overswing. This result is accomplished in the A.C. meters, where it is especially important, by magnetic damping; an aluminum disc moving in the concentrated field of two permanent magnets. Damping of this nature is possible with these meters because they operate on the most improved form of the induction principle and are, therefore, unaffected by the fields of the permanent magnets. The torque of the meters is so high that the air dampers used in some delicate forms of meters would be entirely inadequate; and this high torque makes possible the use of correspondingly substantial control springs.

The clearness of the magnetic dampers, as well as the air gaps of the movements, are large, and accidental friction from this source is thus rendered almost impossible. The whole construction of the meter is simple and rugged, so that the initial accuracy is maintained for long periods; and repairs, when necessary, can be made by the average central station attendant without sending the meter back to the factory.

NEWS NOTES

INCORPORATIONS.

SAN DIEGO, CAL.—Hall's Sanitary Telephone Mouth Piece Company has filed articles of incorporation. The incorporators are Joseph A. Hall, S. H. Hall, Claude Woolman, A. C. Shreve and C. W. Barber. The company is capitalized at $35,000.

ILLUMINATION.

MOSCOW, IDAHO.—The University of Idaho is contemplating installing a system of ornamental lighting on the campus. Different methods are under consideration.

HEMET, CAL.—Fred B. Mechling, who purchased franchise rights to operate an electrical system in the cities of Hemet and San Jacinto, has made application to transfer the same to the Southern Sierras Power Company.

SEBASTOPOL, CAL.—The Trustees have passed an ordinance granting the Great Western Power Company permission to construct and maintain a line of poles and wires for transmitting electricity to Sebastopol, for a period of 50 years.

GILROY, CAL.—The Coast Counties Gas & Electric Company has applied for permission to purchase the capital stock of the Gilroy gas works. The price is given at $25,000. The Gilroy gas works is the assignee of the lease of the municipal plant in Gilroy.

KLAMATH FALLS, ORE.—B. E. Kerns, son of a former banker of Chico, has purchased the Thomas McCormick power plant below Keno and will start work at once building new ditches, dams and falls for power development. New machinery will be installed in August.

GLENDALE, ARIZ.—Bids have been opened for furnishing material and fixtures for the electric lighting department. The bid for $14,000 of the bond issue received from Torrance, Marshall & Company, offering par, accrued interest and premium of $382, was accepted.

WINNEMUCCA, NEV.—The people of this city want their own power, light and water plant, and for this purpose they have had the County Commissioners call a special election for August 15 for the purpose of voting on the question of a bond issue on $180,000 for the purchase of the plant of the Winnemucca Water & Light Company.

LARKSPUR, CAL.—Larkspur is to have gas within the next 60 days, says Manager Wallace Foster of the Pacific Gas & Electric Company. Just as soon as the service is introduced in Larkspur, representatives of the company will be sent to Corte Madera and Mill Valley to solicit contracts with a view of extending the mains there.

SAN FRANCISCO, CAL.—Plans have been completed for a six-story and basement building to be erected on the south side of Mission street east of Second for the Pacific States Electric Company. Among other things, the building will be equipped with an automatic sprinkler system, pneumatic tube system, two elevators and two high-speed electric hoists.

PUEBLO, COLO.—Commissioner Thomas A. Duke on the evening of June 23d, solemnly pronounced the biblical quotation, "Let there be light and there was light." Immediately a small button was pressed and forty-six clusters of fine ornamental lights burst forth on Main street. The event was spectacular and the installation will prove a great asset to the city.

SAN RAFAEL, CAL.—The Pacific Gas & Electric Company has announced another reduction in commercial and residential rates for the County of Marin, which went into effect July 1. Both commercial and residential rates are cut 2c on the former prices, with greater reductions for large consumers. Residence rates are 8c per kw. for first 30 kw.-hr. consumed in any one month; 7c for next 70 kw.hr., 6c for next 100 kw., 5c for all over. Each rate carries a minimum of $1 per month per meter installed.

SAN FRANCISCO, CAL.—The State Railroad Commission has granted the application of the San Joaquin Light & Power Company for a certificate of necessity and convenience to extend its lines into Tulare, Kern and Kings Counties. The company has a contract with the Tulare County Power Company by which it will buy its power from the latter corporation in the territory it seeks to enter. The grant of the permit was vigorously opposed by the Mt. Whitney Power Company, which now occupies the territory the San Joaquin will enter. In the decision the Commission declares the territory at issue is not completely served.

HONOLULU, T. H.—At a meeting of the stockholders of the Honolulu Gas Company the action of the board of directors in authorizing an issue of $300,000 of 5 per cent bonds was ratified. It was announced that the entire issue had already been subscribed for by local capital, which indicates what those most familiar with it think of its prospects. Two hundred thousand dollars of this amount will be used to redeem a like amount of 6 per cent bonds now outstanding. The balance will be used in extending the present plant of the growing company. The trust deed securing the bonds has been arranged. The redemption of bonds is under a sliding scale premium, beginning ten years from July 1, 1912. The company is planning to make very material extensions in its system. Ten miles of pipe for the extension to Kaimuki has already arrived.

GLENDALE, CAL.—Harry B. Lynch, manager of the electric lighting department, states that the extensive work of extending the lighting system, which has been in progress for six months, will be completed by August 1. During the last month the working force of the department has been centered on the laying of the conduits along Broadway between Glendale avenue and Brand boulevard, these being laid on account of the desire of the Trustees that all lines and poles shall be eliminated from Broadway. Throughout most of the distance on Broadway a nine-duct conduit is being laid. On Brand boulevard and Glendale avenue a three-inch fiber duct in concrete is being installed. Ornamental iron standards will be erected at intervals of 100 feet on each side of the street. Since the acquisition by the city of the West Glendale section, connections have been made to the system at the rate of about a hundred a month and the plant is serving more than 1500 customers, with probably 500 still to be connected. The fiscal year has been exceedingly prosperous for this plant. During that time the number of consumers has doubled and the price for juice has been lowered from 10 cents to 9 cents a kilowatt, with $1 minimum.

TRANSMISSION.

LOS ANGELES, CAL.—It is reported that the Nevada-California Power Company has sold $2,000,000 first mortgage 25 year 6 per cent sinking fund bonds of the Southern Sierra Power Company to Chicago bankers.

SAN LUIS OBISPO, CAL.—The Coalinga Water & Electric Company, a branch of the San Joaquin Light & Power Company, has been granted a franchise under which their lines of transmission, power plants, etc., will be operated.

OREGON, CITY, ORE.—The Clackamas Power & Irrigation Company, of which A. McColman of the Failing-McColman Company of Portland is president, is about to construct at the Hagemann power site on the Clackamas River, seven miles from here, a hydroelectric power plant of large proportions. The plans, subject to such charge as further explana-

tions may indicate to be advisable, contemplate a dam which will give a head of 60 feet. Wheels and electrical generators for the developing of 10,500 electrical horsepower will be installed at first with provision for later installation sufficient to bring the total to 17,500 horsepower. The power will be used principally for railroad purposes. The construction will be of concrete and steel, first class in every particular, and with the land to be acquired will cost upwards of $1,000,000, and will be completed by 1914.

TRANSPORTATION.

PALO ALTO, CAL.—The Peninsula Railroad Company has completed preparations to extend its Waverly line in Palo Alto to a point opposite the Mayfield depot.

EL PASO, TEX.—The Stone & Webster Engineering Corporation has purchased in Fresno supplies and material for a $4,000,000 street railway, which is to be constructed there.

MESA, ARIZ.—A franchise has been granted the Salt River Valley Railway Company to operate for a period of 25 years an electric railway system over certain streets in the town.

SAN LUIS OBISPO, CAL.—Walter G. Lincoln has been awarded a franchise to maintain for a period of 50 years a single or double track electric railroad over certain roads of the county.

CLE ELUM, WASH.—The Kittitas Railway & Power Company, Paul Richards, Tacoma, president, will start work in about 10 days building an electric line between Cle Elum and Ellensburg.

GREAT FALLS, MONT.—The Great Falls Terminal Railway Company has been organized, backed by the Milwaukee, and will construct several short lines in this city and surrounding country.

EL PASO, TEX.—The West Ysleta Townsite Company has a contract with Stone & Webster to build a substation at West Ysleta. Construction on the interurban line will begin this month.

ORANGE, CAL.—A finance committee of 50 citizens has been organized to have charge of a campaign for raising $22,000 needed to buy the right of way for the Pacific Electric extension from Santa Ana to Orange.

SAN BERNARDINO, CAL.—The citizens of Cucamonga district have started a campaign to secure right of way for the Pacific Electric's trunk line between San Bernardino and Los Angeles. It is expected between $10,000 and $20,000 will be necessary.

LORDSBURG, CAL.—The superintendent of construction for the Southern Pacific Railroad was here recently, making the trip on foot over that portion of the line which is to be electricized, for the purpose of determining the exact number of rails and bonding material necessary.

SAN DIEGO, CAL.—Although G. W. Parsell, promoter of the San Diego, Riverside and Los Angeles Railroad, was four days late in filing a $14,000 bond for an extension of time on that part of his franchise within the municipal limits, the Council probably will accept the surety.

SAN BERNARDINO, CAL.—The Pacific Electric Company has secured a 12-acre addition to the eight acres of land purchased by the city as a site for eastern terminal shops to be located here. Rights of way are being secured for the trunk line which is to be built between San Bernardino and Los Angeles.

SACRAMENTO, CAL.—The main shops of the Northern Electric Company will be moved from Chico to Sacramento as soon as a suitable site can be found and buildings erected, the Chico shops to be retained as a repair station. In view of the more or less close affiliation of interests back of the electric lines which are spreading a network over the Sacramento Valley, converging in this city, the proposed shops will be sufficient to handle the repair work of practically every interurban electric road in Northern California.

TULARE, CAL.—Frank Tvery, organizer of the Big Four Electric Railway, and J. H. Hitchcock, president of the road, have purchased from W. A. Higgins of Tulare, the entire townsite of the city of Woodville, comprising 725 acres. The consideration was $11,000. The purchase was made as an investment on the eve of beginning construction of the road to the Woodville section. Sixty teams have begun work on the Tulare-Woodville branch of the road. The grading will be completed within 45 days.

TELEPHONE AND TELEGRAPH.

LAS VEGAS, NEV.—An order has been made to the City Council directing the Consolidated Power & Telephone Company to secure a franchise to do business in this city.

DILLON, MONT.—The forestry service will commence the building of a telephone line from Argenta to Grasshopper, through the Elkhorn country, over the divide and down Wise river as far as the Swamp Creek station, a distance of about 85 miles.

LOS ANGELES, CAL.—The Postal Telegraph Cable Company has applied for a franchise to construct and maintain a conduit and pole and line system through certain streets of the city for the transaction of its business, and the Board of Public Utilities has been considering a proposed ordinance granting this franchise.

PHOENIX, ARIZ.—The Mountain States Telephone & Telegraph Company, which has lately bought out the Overland Company and Consolidated also, will be allowed to operate under order and permit issuing out of the Corporation Commission. The company will be forced to put in many additional improvements.

RIVERSIDE, CAL.—The Chamber of Commerce has again taken up the question of the consolidation of the two telephone systems in operation in this city. Since the franchise of the Pacific Telephone Company expires within a few months, and the United States Supreme Court has held that the company may not operate without a franchise, some of the members see in the situation an opportunity for bringing about an amalgamation of the Pacific and Home systems. President S. C. Evans appointed a committee consisting of Charles L. Reynolds, S. J. Castleman and S. S. Patterson to urge before the City Council the proper consolidation of the two companies.

WATERWORKS.

SPOKANE, WASH.—To make possible the plan of selling $50,000 in water main extension improvement bonds to small investors by the city treasurer at private sales. Corporation Counsel H. M. Stephens has submitted a draft of an amendment to 32 city ordinances inaugurating the water main improvements.

MOSCOW, IDAHO.—This city is to have new water mains in the recently established paving district, consisting of over 30 blocks. The pipes are to be purchased by the city, and the work done under supervision of Water Commissioner Geo. R. Carlson. The estimated cost for the pipes and laying of the same is $15,000.

HOOD RIVER, ORE.—The fruit growers of Underwood and Hood have taken steps toward organizing the Underwood Water District and have chosen G. H. Marsh president and Prof. Detwiller secretary-treasurer. A bonding system similar to the Hood River Irrigation District, is contemplated. Moss Creek, a tributary of Little White Salmon, will be tapped at an elevation of about 2000 feet. From here a gravity system can be built which will easily serve the Underwood-Cooks apple belt with an abundance of pure mountain water at a moderate expense.